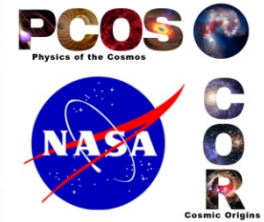


# H4RG Near-IR Detector Array with 10 micron pixels for WFIRST and Space Astrophysics

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## Description and Objectives:

- Develop the 16 megapixel H4RG-10 near-IR detector array to TRL-6 for WFIRST in time for the Astrophysics Mid-Decadal Review
- WFIRST Science Definition Team identified the H4RG-10 as the critical enabling technology that is needed for achieving the aims of the Astrophysics Decadal Survey *New Worlds, New Horizons*
- Mature this technology to minimize risk, cost, and schedule
- Reduce the persistence and noise of large format high resolution infrared array detectors

## Key Challenge/Innovation:

- Hybridization improvements to meet WFIRST pixel operability requirements in 4K x 4K, 10  $\mu\text{m}$ /pixel format
- Pixel design improvements to meet WFIRST read noise requirements and reduce persistence

## Approach:

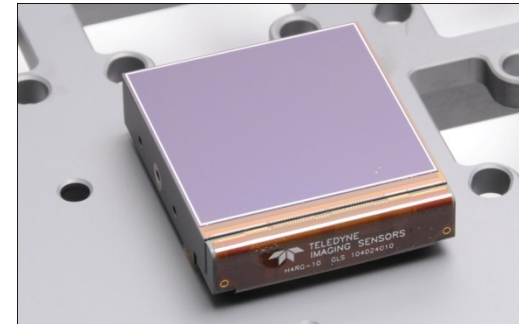
- Teledyne study to improve pixel interconnect yield
- Teledyne study to optimize process and improve read noise
- Fabricate lot splits of H4RG-10s at Teledyne
- Characterize H4RG-10s vs. WFIRST requirements in Goddard Detector Characterization Laboratory (DCL) and Teledyne
- Characterize H4RG-10s for WFIRST weak lensing and persistence at JPL/CalTech
- Environmental testing for TRL-6

## Key Collaborators:

- Jason Rhodes (JPL: Institutional PI)
- Donald N.B. Hall (University of Hawaii)
- Bryan Dorland (U.S. Naval Observatory)
- Ed Cheng (WFIRST)
- Roger Smith (CalTech)

## Development Period:

- FY13 – FY15



This H4RG-10 is identical to one that was tested in the Goddard DCL in 2011. It consists of a 4K x 4K pixel array of HgCdTe pixels mated to a silicon readout. It met all WFIRST performance requirements except: (1) pixel operability and (2) read noise

## Accomplishments and Next Milestones:

- Demonstrate pixel interconnect operability yield >98%: Sept 2013
- Demonstrate an H4RG-10 that meets WFIRST performance requirements: Dec 2013
- Demonstrate an H4RG-10 that meets WFIRST environmental requirements: Dec 2014
- Complete TRL-6 demonstration: End of performance period

## Application:

- WFIRST
- Explorer class near-IR missions
- Ground and space based astrophysics programs
- This is a broadly enabling technology for astrophysics

**TRL<sub>in</sub> = 4    TRL<sub>current</sub> = 4    TRL<sub>target</sub> = 6**